

CLAIMS

1. A substrate processing system comprising:
 - a processing tank for processing substrates with a processing liquid;
 - a drying unit disposed above the processing tank;
 - a carrying mechanism for carrying the substrates between the processing tank and the drying unit;
 - a processing gas supply line for supplying a processing gas into the drying unit;
 - inert gas supply lines for supplying an inert gas into the drying unit;
 - a first discharge line for discharging an atmosphere purged from the drying unit; and
 - a second discharge line for forcibly exhausting the drying unit.
2. The substrate processing system according to claim 1, wherein
 - a first inert gas supply line for carrying a heated inert gas is connected to the processing gas supply line, and the inert gas supply line serves as a second inert gas supply line for carrying an inert gas of an ordinary temperature.
3. The substrate processing system according to claim 1, wherein
 - the drying unit is provided with discharge pipes each having a base part connected to the first discharge line and a free end part inserted in the drying unit,
 - each of the discharge pipes is provided with a plurality of inlet holes arranged in a line,
 - areas of the inlet holes of each discharge pipe nearer to the base part are smaller and those of the inlet holes of the discharge nozzle nearer to the free end part are greater.
4. The substrate processing system according to claim 1, wherein
 - the drying unit is constructed such that the drying unit can be set in an open state in which the drying unit opens into the outside atmosphere when the carrying mechanism carries

the substrates into the processing tank and in a closed state in which the interior of the drying unit is isolated from the outside atmosphere, and

a controller sets the drying unit selectively in either of the open state in which the drying unit opens into the outside atmosphere and the closed state in which the interior of the drying unit is isolated from the outside atmosphere.

5. The substrate processing system according to claim 4, wherein

the processing tank processes the substrates with a chemical and a rising liquid,

and the controller opens the drying unit into the outside atmosphere when the chemical is contained in the processing tank, isolates the interior of the drying unit from the outside atmosphere upon the completion of replacing the chemical contained in the processing tank with the rinsing liquid and isolates the interior of the drying unit from the outside atmosphere while the drying unit is operating for a drying process.

6. The substrate processing system according to claim 4, wherein

the drying unit includes a vessel body having an open end, a top cover for covering the open end of the vessel body, and a top cover lifting mechanism combined with the top cover and capable of placing the top cover at an open position for carrying the substrates into and out of the vessel, a half-open position for forming a gap between the open end of the vessel and the top cover or a closing position for closing the open end of the vessel body,

the top cover lifting mechanism is controlled by the controller, and

the controller controls the top cover lifting mechanism to place the top cover at the open position or the half-open position to open the drying unit into the outside atmosphere and to place the top cover at the closing position to isolate the interior of the drying unit from the outside atmosphere.

7. The substrate processing system according to claim 4, wherein

the drying unit includes a vessel body defining a chamber and having an open end, a top cover for covering the open end of the vessel body, the top cover is provided with a vent, a vent closing member closes the vent, and the controller controls the vent closing member.

8. A substrate processing system comprising:

a processing tank for processing substrates with a processing liquid;

a drying unit disposed above the processing tank; and

a carrying mechanism for carrying the substrates between the processing tank and the drying unit;

wherein the drying unit can be set in an open state in which the drying unit is opened into the outside atmosphere when the carrying mechanism carries the substrates into the processing tank or a closed state in which the interior of the drying unit is isolated from the outside atmosphere, and a controller sets the drying unit selectively in the open state in which the drying unit is opened into the outside atmosphere or the closed state in which the interior of the drying unit is isolated from the outside atmosphere.

9. The substrate processing system according to claim 8, wherein

the processing tank processes the substrate with a chemical and a rinsing liquid, and

the controller opens the drying unit into the outside atmosphere when the chemical is contained in the processing tank, isolates the interior of the drying unit from the outside atmosphere upon the completion of replacement of the chemical contained in the processing tank with the rinsing liquid, and isolates the interior of the drying unit from the outside atmosphere while the drying unit is operating for a drying process:

10. The substrate processing system according to claim 8, wherein

the drying unit includes a vessel body defining a chamber and having an open end, a top cover for covering the open end of the vessel body, and a top cover lifting mechanism combined with the top cover and capable of placing the top cover at an open position for carrying the substrates through the open end of the vessel body into and out of the vessel body, a half-open position for forming a gap between the open end of the vessel body and the top cover or a closing position for closing the open end of the vessel body,

the top cover lifting mechanism is controlled by the controller, and

the controller places the top cover at the open position or the half-open position to open the drying unit into the outside atmosphere and places the top cover at the closing position to isolate the interior of the drying unit from the outside atmosphere.

11. The substrate processing system according to claim 8, wherein

the drying unit includes a vessel body defining a chamber and having an open end and a top cover for covering the open end of the vessel body, the top cover is provided with a vent, a vent closing member closes the vent, and the controller controls the vent closing member.

12. A substrate processing method to be carried out by a substrate processing system including a processing tank for processing substrates and a drying unit disposed above the processing tank, said substrate processing method comprising:

a chemical processing step of chemically processing substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrates by the drying unit; wherein fresh air is supplied into the drying unit and the drying unit is exhausted of gases during the chemical processing step, and

an inert gas is supplied into the drying unit and the drying unit is exhausted at a discharge rate lower than that at which the drying unit is exhausted during the chemical processing step after the chemical contained in the processing tank has been replaced with the rinsing liquid.

13. A substrate processing method to be carried out by a substrate processing system including a processing tank for processing substrates, a drying unit disposed above the processing tank, having an open end, and a top cover for covering the open end, said substrate processing method comprising:

a loading step of opening the top cover and carrying substrates through the open end of the drying unit into the processing tank;

a chemical processing step of chemically processing the substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrate by the drying unit with the open end closed by the top cover;

wherein the top cover is removed to open the open end of the drying unit and the drying unit is exhausted of gases during the chemical processing step, and

the open end of the drying unit is covered with the top cover, an inert gas is supplied into the drying unit and the drying unit is exhausted after the chemical contained in the processing tank has been replaced with the rinsing liquid.

14. The substrate processing method according to claim 13, wherein

a gap between the top cover and the open end during the chemical processing step is narrower than a gap between the top cover and the open end during the loading step.

15. The substrate processing method according to claim 13, wherein

after the chemical contained in the processing tank has

been replaced with the rinsing liquid, the drying unit is exhausted at a discharge rate lower than that at which the drying unit is exhausted during the chemical processing step.

16. A recording medium storing software to be executed by a control computer for controlling a substrate processing system, including a processing tank for processing substrates and a drying unit disposed above the processing tank, to make the substrate processing system carry out a substrate processing method comprising:

a chemical processing step of chemically processing substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrates by the drying unit;

wherein fresh air is supplied into the drying unit and the drying unit is exhausted of gases during the chemical processing step, and

after the chemical contained in the processing tank has been replaced with the rinsing liquid, an inert gas is supplied into the drying unit and the drying unit is exhausted at a discharge rate lower than that at which the drying unit is exhausted during the chemical processing step.

17. Software to be executed by a control computer for controlling a substrate processing system, including a processing tank for processing substrates and a drying unit disposed above the processing tank, to make the substrate processing system carry out a substrate processing method comprising:

a chemical processing step of chemically processing substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrates by the drying unit; wherein fresh air is supplied into the drying unit and the

drying unit is exhausted of gases during the chemical processing step, and

after the chemical contained in the processing tank has been replaced with the rinsing liquid, an inert gas is supplied into the drying unit and the drying unit is exhausted at a discharge rate lower than that at which the drying unit is exhausted during the chemical processing step.

18. A recording medium storing software to be executed by a control computer for controlling a substrate processing system, including a processing tank for processing substrates, and a drying unit disposed above the processing tank, having an open end, and provided with a top cover covering the open end, to make the substrate processing system carry out a substrate processing method comprising:

a loading step of opening the top cover and carrying substrates through the open end of the drying unit into the processing tank;

a chemical processing step of chemically processing the substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrates by the drying unit with the open end closed by the top cover;

wherein the top cover is removed to open the open end of the drying unit and the drying unit is exhausted of gases during the chemical processing step, and

after the chemical contained in the processing tank has been replaced with the rinsing liquid, the open end of the drying unit is covered with the top cover, an inert gas is supplied into the drying unit and the drying unit is exhausted.

19. Software to be executed by a control computer for controlling a substrate processing system, including a processing tank for processing substrates, and a drying unit disposed above the processing tank and having an open end and provided with a top cover covering the open end, to make the

substrate processing system carry out a substrate processing method comprising:

a loading step of opening the top cover and carrying substrates through the open end of the drying unit into the processing tank;

a chemical processing step of chemically processing the substrates with a chemical contained in the processing tank;

a processing liquid changing step of replacing the chemical contained in the processing tank with a rinsing liquid; and

a drying step of drying the substrates by the drying unit with the open end closed by the top cover;

wherein the top cover is removed to open the open end of the drying unit and the drying unit is exhausted of gases during the chemical processing step, and

after the chemical contained in the processing tank has been replaced with the rinsing liquid, the open end of the drying unit is covered with the top cover, an inert gas is supplied into the drying unit and the drying unit is exhausted.